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ANALYTICAL STUDY IN ALGERIA: THE QUESTION OF THE DIVISION OF LABOR BETWEEN ARCHITECTS AND ENGINEERS BASED ON THE CONCEPT THE OATH AND COMPLEMENTARITY

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Abstract

Nowadays, in Algeria, the institutional and practical context differs between the profession of architects and engineers. The latter are devoid of the concept of an oath. This concept can be the catalyst and generator of responsibility, equality, and merit between these two professions. To achieve complementarity between these two professions, a research approach based on a questionnaire is carried out at architectural design offices and technical design offices in Algeria. Nationally, the work situation is sequential and linear in which the engineer works under the responsibility of the architect. At the international level, the process is organised between architectural design offices and technical design offices, an iterative process. How to achieve this culture of complementarity of international practices in Algeria?

Keywords: Architect, Engineer, Division of labour, Complementarity,

1. Introduction

The interest aroused by the absence of analytical studies in Algeria on the question of the division of labor between architects and engineers in particular their degree of interaction, in relation to international practices using the concept of the oath. Oaths were ubiquitous rituals in ancient Athenian legal, commercial, civic and international spheres (Judith Fletcher, 2015). An oath is a framework for committing oneself to actions based on competence and skill. It is *"a formal promise, made within the framework of your peers, to respect the moral values and*

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behaviours of your discipline ... a commitment made by an individual, who is then guided by his conscience to achieve it." an architect and engineer can build public confidence in the profession. The oath is the pillar of the interactional relationship between the two designer actors in a situation of complementarity.

Nowadays, Engineers undertake to respect the solemn duties described by architects who work in direct contact with the client. These Algerian architects are sworn in under their tutelage, the National Council of Architects. While the supervision of engineers only came into being in 2003 after the great disaster in the city of Boumerdès in Algéria.

The present study attempts to present an analytical study in Algeria based on a quantitative research in in order to interpret it and contribute to existing scientific knowledge. The dialogue is impossible between two people who have different languages. The result of the struggle is always the same. "*science prevails and the final design has generally lost the eventual charmed and fitness of detail dreamed by the architect*" (Faber, 1963, p14).

To bring this institutionalized approach to light, a body of law can serve as a common thread for the practice. Law no.85-704 of July 12, 1985 relating to public project management and its relationship with private project management, known as the MOP law, is a French law, which is put in place for public contracts, the organization of the relationship between project management and project management. Repealed by Ordinance No. 2018-1074 of November 26, 2018 - art. 18 (V). The article of Decree n ° 93-1268 of November 29, 1993 relating to project management missions entrusted by public contractors to service providers.

In Algeria, we can underline that, *"with regard to civil engineers, law n ° 01-05 of August 14, 2004, amending and supplementing law n ° 90-29 of December 1, 1990 relating to planning, has introduces an extremely important provision in its article 5, which stipulates that the construction projects submitted for building permit must be jointly developed by an architect and a certified engineer, within the framework of a project management contract"* Posted in (El Watan 05 - 02 - 2006).

"The regulations are clear, the building project management must concern groups of architects and engineers in civil engineering, and both approved and bound by a project management contract". Posted in (El Watan 06 - 04 - 2010).

On the national scene, the body of engineers of structure, fluids, acoustics, performs tasks under the responsibility of the architect in the project management according to the MOP law. This situation favours the linear design process. *''The body of Algerian engineers does not have a National Council of Engineers, CNIA''* (El Watan, 2010).

- The French National Council of Engineers, CNIF, was created in 1957. This legitimacy of the two bodies, the international, has given rise to a model of, Architecture study office, BEA, and Technical study office, BET. Complementary work becomes an iterative process. It is institutionalized collective work.

The hypothesis is that as it stands, this division of labor involves a sequential and linear process between architects and engineers, avoiding recourse to complementarity this to remedy the problems of loss of time, economy, feasibility and the quality of execution of the project. Complementarity is a collective activity, which can be a situation full of interactions between the two functions. The regulatory adaptation of the ethics and professional conduct charter based on the "oath concept" with a view to remedying this situation of division of labor between architects and engineers.

The uniqueness of this research lies in the exploration of the work situation of Algerian architects and engineers of different statuses by revealing the importance of the charter of ethics and professional conduct. This research could be a plate form for the decision-makers and designers to recognize influence, review the granting of approvals to the two professions, and explore other forms that can promote the work situation of Algerian design office, BEA, and technical office,BET, to international standards.

The initial training of architects and engineers predisposes them to an architectural and engineering culture. The way of thinking, of specific representation of the ergonomic and structural space, based on the imaginary, allows them to master the project from the project management phase until its maintenance.

Daniel Goleman (1998) said, *"It is about intelligence quotient, diploma and technical expertise"*. Both professions need these performances to provide a reflection on the organization of space and its structure from a technical and economic point of view. Jean Prouvé (1990) related that the two disciplines architecture and structure are inseparable and must exist together *"For me there is no architecture without structure, architecture is an object built in the space, it must be structured''.*

2. Theoretical framework

In Algeria, the reglemantation of the project management and work has meant that the engineer performs tasks under the responsibility of the architect. As a result, the responsibility for the quality of the work lies with the architect, and congratulations go to the latter.It is noted that the presence of the civil engineer next to the architect is necessary Which is stated as an establishing and intelligible way of working between the two professions in time and in space. *"Without Engineer, nothing stand up. Without architect we would want it to" ...etc.*

It is observed that the quality of Algerian buildings has not reached the level of the achievements of international academic offices. It can be noticed in the failure to take the oath to the civil engineer and hold him responsible for the project with his colleague the architect. Herein lies the concept of integration, which can harm the perfect coexistence between the architect and the engineer. In addition, from it floats the behavior of competition, valuing the creative idea, and making the civil engineer face the customer.

The research interest of this work is to understand the relationship between architects and engineers in a process from the division of labor to complementarity in Algeria. This section present a brief theoretical, sociological, and empirical overview of the relationship between the two professions. Presentation of an analysis of professional situation modalities will serve as a platform for bringing these two professions together. This research studies the concept of oath and complementarity, which serve as a platform to elucidate the process of the division of labor between Algerian architects and engineers.

2.1. The project as a space for professional interactions

A project, designed and carried out by the architect and engineer, has the advantages of better professional and interdisciplinary interaction for the prevention against the risk of earthquakes or collapse of its structures. The division into specialized skills has caused negative effects; the volume of knowledge has become too large for the brain. But, interdisciplinarity only works to the extent that a discipline is immediately accompanied by the germ of knowledge and values specific to other disciplines. Michael Carley (2000) emphasizes this professional situation *"the architect and the engineer proceed from two completely different visions of the world (Project of life) : the architect appropriates the world with all these stimuli, his product comes from human for humans, the world of the engineer is perceived through mechanics and its product is derived, and responds to the natural sciences "*. In agreement with Michael Carley, during the professional interaction complementarity is necessary to better manage the project.

2.2. Technical growth

In the 19th century, the Industrial Revolution shook the more or less stable hierarchy that had been established between the three specializations, the artist, the craftsman and the scientist. The man of the tool will have to retrain and become the man of the machine. This transformation is supported by the creation of new schools, which will constitute the framework of the new economic and social situation, the engineers. The School of Roads and Bridges is the first engineering school in the world. It was founded in 1747, with those of Mines and Polytechnique. During this time, engineering conquered other areas of building construction, including infrastructure and their structures. On the other hand, the architects ensure the aesthetic sublime.

The 19th century therefore marks the beginning of the latent antagonism that still exists today between architects and engineers, some retaining most of their prerogatives in the construction sector, others claiming the monopoly of art. , entering this semantic sphere which makes men of them. Art, professionals able to link abstract design and concrete realization in the building. This quality, whether they are protagonists, insists on the use of sublimity in their buildings.

2.3. Separation and rapprochement between the two disciplines

Bringing together architecture and engineering as constructive practices is of paramount importance. According to Jean-Pierre Epron (1981), this notion of unity between architecture and construction is akin to architecture and [...] engineering, separate fields only come into contact by chance, the day of the appointment to the construction site [...] What need does this […] meet?

In general, engineering includes topics such as fluids, heat, etc., which, while less recognized, no less affect the design phase, especially with regard to specialized buildings requiring the use of a particular technique, as underlined by Jacques Ferrier (1999). It is necessary to heat, light or cool, to take care of the distribution of flows, under penalty of seeing the architect's proposal remain only a pleasant drawing (Jacques Ferrier, 1999). The cohabitation of the two disciplines leads to rediscover the sublime of the buildings built by these two professions.

2.4. Visions of the technical world

Engineering is the open domain of creativity. The respective work of George-Pompidou in France, of Piano-Rice, is so closely interwoven that it is very difficult to say who is responsible for what. The sublime is materialised to its highest level by these professionals. This building is the "high-tech" which is a reference of the dimension of the sublime. According to the Oxford English Dictionary (1988), "high-tech" means a style of architecture (and interior design) that mimics the functionalism of technology. Here is an example in Fig.1.

Fig. 1. : View of the facade Project: Georges Pompidou, France, 1969, Renzo Piano& Peter Rice

Source: Author Screenshot

The right solutions appear if the two professions know their jobs, share the same objectives and respect each other. More importantly, if the engagement of the engineer begins early in the programming and design phases of the architect. This will not obtain good results by asking an engineer for a structure under conditions already fixed and limited. According to Jorg Schlaich (1999), the architect must be open to the contribution of the engineer, who want to contribute by proposing alternative structural solutions. Everyone should want to understand each other's ideas and give enough explanation about their work to allow this understanding.

2.5. Reflectivity as a support generating the smooth running of the two disciplines

Reflexivity is the product of the action between architects and engineers. It allows designers, architects and engineers to complement each other. For us, reflexivity allow us to see the project in its entirety. Thus, the emergence of the sublime of the two disciplines is perceived, experienced through its multiple dimensions as following: aesthetic, technical and functional. The effect of the action between these two protagonists leads to reflexivity. The interactions between architects and engineers constitute a set of experiences, which reveal the unsaid of the two professions in their relative autonomy. In addition, beyond that, the sublime emerges in the realisation of the project by the protagonists of both disciplines.

The sublime expressed in dimensions of promotion, prestige and size, may be the result of the revelation of the symbolic dimension of architectural design by the architect to the engineer, who does the opposite through his skills in construction. The two disciplines go together for the objectification of these concepts found in different masterpieces. The sublime thing about architecture and engineering is to properly help users with their projects so that they feel

involved. The end result lives up to their expectations in the materialization of sublime concepts.

They strive to keep their satisfaction rate in perpetual growth. Along with reflexivity, someone could say that the creativity and innovation of both are at the heart of the approach to the sublime, architecture and engineering. The masterpieces that pass through the hands of architects and engineers are designed in a constructive logic in order to facilitate the task of the stakeholders and to optimize the aesthetic and technical dimension of the building designed and constructed for the good of human being.

In their design and production work, the protagonists explore how the dimension of the sublime nourishes and shapes the spatiality of individuals and their decision-making processes. This influences other dimensions (ethical, technical, functional) of the workspace. Space, as a fundamental element of architecture, takes its source and its birth in the organization of the different components of the architectural elements, which delimit this space and give it the notion of promotion, prestige and grandeur. For us, it is important to stress that aesthetic properties are neither properties of the environment per se, nor simply properties of individuals reacting to that environment. Rather, they are properties that emerge from the interaction between the protagonists.

Aesthetic issues are therefore systemic issues and should be treated as such a space. The aesthetic dimension directly appeals to the imaginative consciousness, which in turn activates the space that exists only in power. Aesthetic space is a product of the imaginative consciousness, which makes the architectural world and the technical world, coexist. The mechanisms that govern the production of the sublime of the two disciplines are the interaction and reflexivity between architects and engineers in the manufacture of masterpiece in its environment for users.

The users and the environment that receive the work are part of a world ruled by monotheism. This brings us to refer to the organic architecture of architect Frank Lloyd Wright, which is based on the concept "The part belongs to everything and everything belongs to the part". It is like in society, "the element serves the group and the group serves the element"

2.6. The evolution of the relationship between architect and engineer

To understand the relationship between architect and engineer, it is important to go back to the origins of builders. At the time, a single professional was responsible for the entire project. The evolution of practices towards more complex projects has brought about a transformation of roles and responsibilities. A movement towards specialization began at the beginning of the 15th century, when the professions of architect and engineer began to be defined separately.

The art of building has become very complex and has resulted in a fragmentation of art and science.

History shows that the evolution of the relationship between architects and engineers is influenced by times and ways of thinking. In this sense, the new challenges of sustainable development, climate change and all the needs for regeneration of ecosystems are transforming the same practices for the reorganization of work and changes in paradigms between the architect and the engineer. Thus, for the past ten years, professionals have been present at the start of the project in order to optimize the initial concept. The engineer is no longer at the service of the architect, but works with him for a common goal of optimizing the project. This makes it possible to create benefit to the latter with a view to complementarity.

The complementarity of well-established roles and responsibilities through a synergy of disciplines avoids the confusion of practices and generates optimal results. The mutual involvement of the architecture and the engineer is therefore beneficial to the project. To this end, the importance of complementarity does not lie only in the architect and engineer relationship, but in the existence of a dialogue. Dialogue, communication, pushes the two actors to go as far as possible from their art and allows the synthesis of different thoughts to lead to a common creative and innovative project.

2.7. The training of the two professions in Algeria

The two professions appeared in Algeria, between 1830-1962, as the result of an internal dynamic of modernization of Algerian society by the colonizing country, which accompanied the economic development, and technical advances of Europe, France. *"During the year 1949-1950, among the 1973 registered students, there were 271 Algerians"* (Khelfaoui, 2000). The reasons that would have prevented the access of the natives to technical training is political. *"The technical functions are the functions of professional and therefore social supervision ... Colonialism wanted at all costs to avoid having to ensure the supervision of the natives by the natives"* (Khelfaoui, 2000). This training of the two professions saw the light of day in three periods.

2.7.1. The colonial era

The engineering profession appeared as early as the Ottoman Empire almost at the same time in Europe, since a first school had been created in 1909. The great engineering school was set up to train civil engineers responsible for road works (Perassimos 1990). In 1894, a ministry for the colonies was created and the French society of colonial engineers, created in 1895, brought together the engineers acquired in the "expansion work", with the mission of exploiting the conquered territories (Vacher, 2004) in 1958, this institution took the name of

the National School of Engineers of Algeria. It then formed four areas: public works and construction, electronics, electrical engineering and mechanics (Ben guerna, 2001).

2.7.2. The post-independence era

For independent Algeria, National School of Engineers of Algeria was reopened in 1963 under the name *"National Polytechnic School of Algiers". A massive departure of technical executives:"92.8% ٪of senior executives, 82.4% ٪of technicians and supervisors"* (Augeron, 1999). The priority displayed then, by the Algerian political leaders, was to replace these technical frameworks and, secondly, to proceed with the implementation of the development project envisaged by the country. In this process, engineers were given the role of "Builder" (Longuenesse, 1990). The state will then engage them in its administrations and in the public sector companies that it has created, by importing "advanced technologies" (National Charter, 1976).

2.7. 3. Period of economic crisis

This historic phase produced a change in the management of the project. A recourse deemed excessive to "foreign technical assistance" by the "foreign consultancy firms" is then incriminated. National companies are giving way to large SMEs deemed to be easier to control and manage. The project sponsor rarely calls on civil engineering consultancies, generally preferring "architectural consultancies" which are not their trade.

2.8. The division of labor between Algerian architects and engineers

This division of labor has meant that an exclusion often appears in competitions or calls for tenders relating to project management, where "offices specializing in civil engineering" are systematically excluded, always in favor of "design offices of architecture". The latter use civil engineers for subcontracting for "undervalued amounts". When presenting a work or a public infrastructure project, often the name of the architect (or architectural design office) is cited or highlighted. On the other hand, the name of the engineer, bearer of technical knowledge and who participated in the existence of the project is not mentioned on the project as the architect. This is the result of the division of labor. The architect thinks of himself as the conductor. Certainly, but things have changed. The project is complex. He needs other design sciences.

The art of building requires multiple skills and calls on many stakeholders in the design, construction and quality control of buildings and infrastructures. In Algeria, project management is often entrusted out of ignorance and perhaps the non-existence of the status of the engineer exclusively to architectural design offices. In a country like Algeria, ranked among the most exposed to seismic risks and natural disasters, the absence of the intervention of the civil engineer as the main actor during the design and construction process was noticed.

This absence was the result of the disasters of two town in Algéria: El Asnam in 1978 and Boumerdès in 2003.

3. Research methodology:

The present research aims to elucidate the importance and the role of Oath in the working relationship between architects and engineers for a complementarity of symbiosis during their interactions. Of course, within the framework of the codes of ethics and deontology. The Algerian engineers lack a structuring body make them working under architects' supervision, CNOA, National Council of the Order of Architects. What is the favourable concept for managing a primordial interaction relationship between these two professionals: architects are organized since the independence of Algeria. However, how engineers attend this statue as architects.

3.1. Research design

A strategy of describing equality and merit that is used by architects and engineers in design offices to make oath and complementarity effective.

3.2. The research approach

This study uses the quantitative research approach. This quantitative quest leaves the researcher to come to a conclusion based on data analysed on oath, merit, equality, ... etc.

3.3. The data collection method

The data collection method uses the usage of the questionnaire. A statistical quest touched the two professionals involving Algerian architects and engineers, of structure, equipment, fluids, etc. The statistical data was analysed by the Excel software.

4. Results

4.1. The oath as an ethical and deontological dimension to manage the profession: architect and engineer

Ethics and deontology are based on the principle of the oath, which is the fundamental element of all professional practice, even the Archimedean oath.

The oath ensures equality of responsibility and merit between these two professions. With the practice of the oath in the two professions, the exchange relationship is strengthened in the sense of filling the gaps in the process from the division of labor to complementarity.

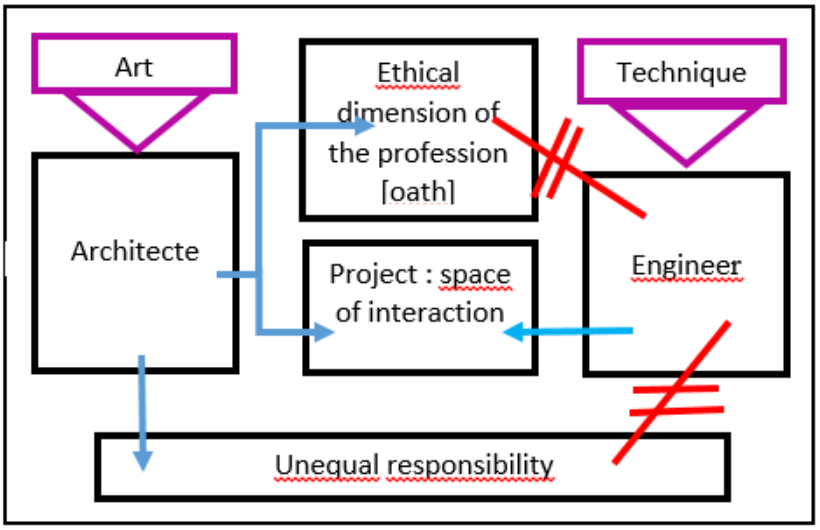
The questions put to architects and engineers in Algeria on the need for the oath and complementarity led to a necessary argument for the establishment of the ethical or deontological dimension.

In these two professions, there is a modality of articulation between architects and engineers as following:

-*Modality* **:** Architects take oath and Engineers do not take oath

In this first modality: in practicing the profession, the two protagonists do not share at the same ethical issues: the oath, Unequal responsibility, unequal merit. Here is an example in Fig.2

Fig- 2. Positive relationship [existence of oath and responsibility] ≠ Negative relationship [no oath, unequal responsibility]



Source: Author

4.2. Statistical data on Architecture study office and Technical study office approved in Algeria

The construction of a sample of this reflection is based on the statistics of 2012-2016 for engineers and architects. It can be noted that the State began to approve engineers in 2012. This period (2012-2016) of the sampling constructed shows, well the division between this two-professions. The body of engineers does not exist before 2012.However, the body of architects, Architecture study office, is the National Council of the Order of Architects that are showed in Table 1

Table - 1. State of architects approved by the State [2012-2016]

		STATE OF ARCHITECTS APPROVED BY THE STATE (2012-2016)					
	WILAYA	YEAR 2012	YEAR2013	YEAR2014	YEAR2015	YEAR2016	TOTAL
1	ADRAR	39	46	49	58	60	252
2	CHELEF	107	114	114	128	136	599
3	LAGHOUAT	76	76	78	79	81	390
4	O E BOUAGHI	149	151	163	175	186	824
5	BATNA	199	239	246	285	302	1271
6	BEJAIA	150	200	214	238	250	1052
7	BISKRA	131	180	179	213	200	903
8	BECHAR	35	40	59	66	60	260
9	BLIDA	141	150	166	218	211	886
10	BOUIRA	55	60	73	99	110	397
11	TAMANRASSET	10	11	16	17	16	70
12	TEBESSA	110	120	139	145	135	649
13	TLEMCEN	98	102	114	159	151	624
14	TIART	35	40	43	70	85	273
15	TIZI OUZOU	235	245	264	266	280	1290
16	ALGER	520	530	549	633	683	2915
17	DJELFA	98	120	122	147	152	639
18	JIJEL	125	127	132	161	164	709
19	SETIF	399	401	434	450	501	2185
20	SAIDA	22	25	29	35	39	150
21	SKIKDA	191	221	238	267	280	1197
22	SIDI BEL ABBES	52	61	82	86	101	382
23	ANNABA	171	182	196	225	245	1019
24	GUELMA	151	161	172	177	180	841
25	CONSTANTINE	160	170	202	325	345	1202
26	MEDEA	121	133	144	157	169	724
27	MOSTAGHANEM	105	109	117	142	152	625
28	MSILA	72	83	94	104	114	467
29	MASCARA	68	75	78	82	80	383
30	OUARGLA	75	80	87	93	83	418
31	ORAN	235	240	247	299	320	1341
32	EL BAYADH	29	32	34	37	39	171
33	ILLIZI	18	18	21	21	27	105
34	B B ARRERIDJ	124	127	131	140	158	680
35	BOUMERDACE	47	58	63	80	88	336
36	EL TARF	56	57	58	59	60	290
37	TINDOUF	8	8	11	9	10	46
38	TISSEMSILT	16	18	23	28	32	117
39	EL OUED	118	120	125	136	145	644
40	KHENCHELA	48	51	54	61	65	279
41	SOUK AHRAS	65	75	89	100	112	441
42	TIPAZA	58	61	75	85	107	386
43	MILA	150	158	171	179	188	846
44	AIN DEFLA	83	90	110	128	140	551
45	NAAMA	54	63	70	79	90	356
46	AIN TEMOUCHENT	50	50	50	54	60	264
47	GHARDAIA	28	29	33	60	68	218
48	RELIZAN	68	68	72	72	75	355
	TOTALE	5155	5575	6030	6924	7335	31022

Source: Ministry of Housing of Algeria, email, 13/12/2016: yhammouche_dz@yahoo.fr>
Cc : mouloud_archi@yahoo.fr,clubnazim@yahoo.fr

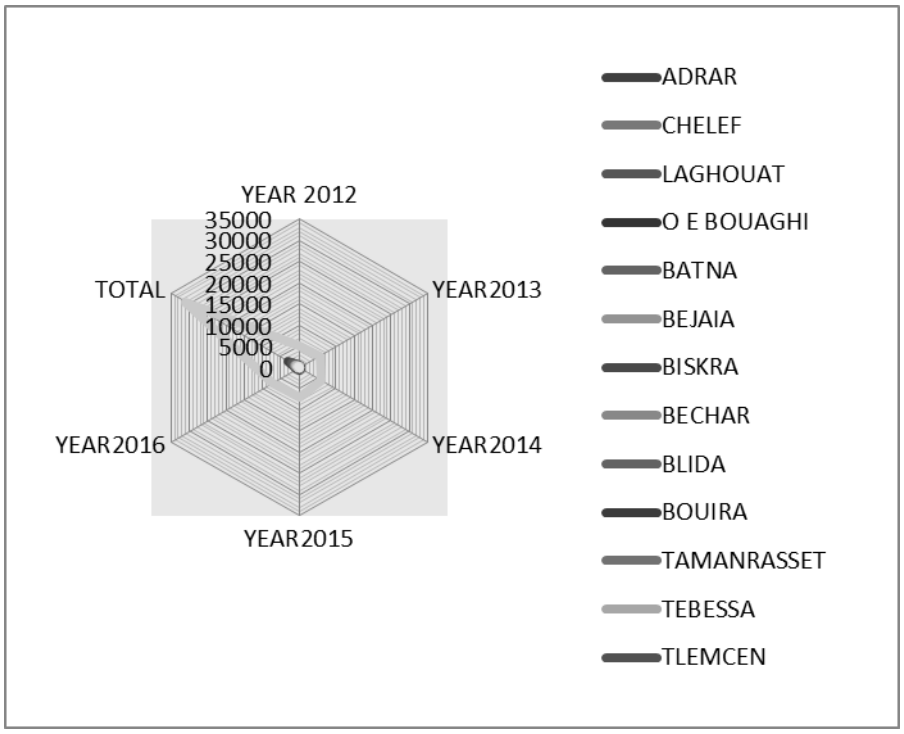


Fig.4- Distribution of architects' approvals between [2012-2016]

Table - 2. State of engineers approved by the State [2012-2016]

	STATE OF ENGINEERS APPROVED BY THE STATE (2012-2016)					
WILAYA	YEAR 2012	YEAR2013	YEAR2014	YEAR2015	YEAR2016	TOTAL
ADRAR	39	46	49	58	60	252
CHELEF	18	12	7	128	136	598
LAGHOUAT	20	6	13	3	8	390
O E BOUAGHI	30	12	11	3	12	524
BATNA	39	26	27	16	37	145
BEJAIA	58	37	31	21	38	185
BISKRA	56	31	25	10	32	154
BECHAR	7	11	4	3	3	28
BLIDA	38	15	27	6	24	110
BOUIRA	20	14	19	10	12	75
TAMANRASSET	4	10	4	2	3	23
TEBESSA	31	15	8	4	23	81
TLEMCEN	25	16	11	13	18	83
TIART	20	10	6	4	5	45
TIZI OUZOU	55	46	28	19	64	212
ALGER	112	68	70	31	112	393
DJELFA	53	33	23	8	27	144
JIJEL	37	26	12	8	25	108
SETIF	57	39	24	11	39	170
SAIDA	9	3	1	1	6	20
SKIKDA	45	23	37	10	24	139
SIDI BEL ABBES	29	15	17	13	18	92
ANNABA	25	18	8	13	27	91
GUELMA	12	10	6	4	7	39
CONSTANTINE	68	27	27	14	43	179
MEDEA	37	12	15	12	23	99
MOSTAGHANEM	16	4	12	4	15	51
MSILA	26	22	27	13	32	120
MASCARA	15	17	6	7	13	58
OUARGLA	24	18	7	8	12	69
ORAN	28	33	12	19	28	120
EL BAYADH	3	9	2	1	6	21
ILLIZI	2	2	1	0	2	7
B B ARRERIDJ	25	13	13	9	23	83
BOUMERDACE	19	9	13	14	27	82
EL TARF	3	4	1	2	3	13
TINDOUF	0	1	0	1	0	2
TISSEMSILT	14	8	8	1	8	39
EL OUED	26	15	15	10	42	108
KHENCHELA	22	5	10	4	13	54
SOUK AHRAS	23	11	5	4	8	51
TIPAZA	8	12	3	5	6	34
MILA	35	20	12	9	21	97
AIN DEFLA	28	9	9	8	7	61
NAAMA	3	2	2	3	2	12
AIN TEMOUCGENT	4	4	1	1	2	12
GHARDAIA	21	19	19	7	27	93
RELIZAN	13	3	10	9	2	37
TOTALE	1290	783	669	389	968	4099

Source: Ministry of Housing of Algeria, email, 13/12/2016: yhammouche_dz@yahoo.fr>
Cc :mouloud_archi@yahoo.fr,clubnazim@yahoo.fr

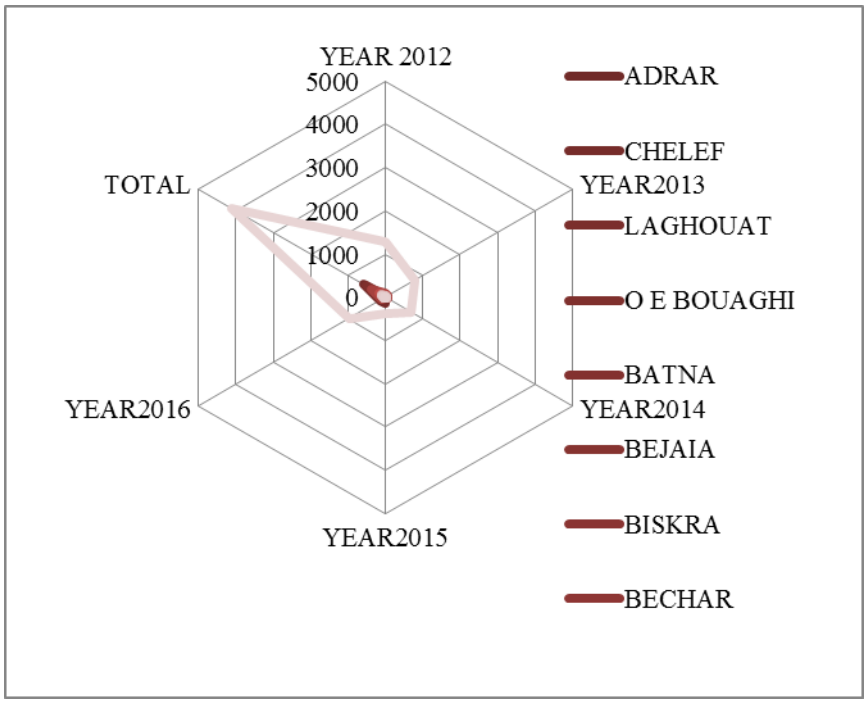


Fig. 5- Distribution of engineers' approvals between [2012-2016]

In the central region, the BEA approval rate is higher than the BET approval rate. This is explained by the non-existence of the Order of Engineers before 2012. After this date engineers begin to have legal status, BET.

It can be seen that the dimension of complementarity can be reinforced on a large scale between architecture and engineering from the point of view of project management regardless of its size. That is, the existence of competent and expert training.

Long before accreditation, a conflict for recognition arose around the status of the engineer. The architect takes himself as the main actor in the design. The thinking of the architect is generally more holistic than that of the engineer, which is more in the domain of applied science.

5. Discussion

The application for granting approvals to engineers for the opening of technical study office began in2012 after the earth earthquake disaster that destroyed a large part of buildings in a town of Boumerdès, in Algeria. However, in France the National consul of engineers exist since 1957. It is the training of two profiles: architect-engineers and engineer-architects. This ambiguous situation of Algerian engineers without a corps makes them dominated by the architects organised under a National Council of the Order of Architects. As a result, the architects and engineers in Algeria still practicing the sequential and linear process in their

interaction. However, the two corps, architects and engineers in France, are iterative situation during their interaction at the scale of design office and technical office.

Complementarity is a necessary step to conquer the fact of the division of labor. Complementarity, as a collective activity, can be a support to promote a new model of architectural and technical study office, BEAT, composed of architect and engineer, based on the quality and size of architectural and engineering studies offices reflecting the qualities of a international model to be able to overcome the challenge of designing and carrying out large-scale projects.

Currently, the process for the composition of these design office, BEA and technical office, BET is a minimum size, 01 architect and a 01 secretary. The latter cannot manage the architectural project development process according to these different stages: project management, execution, planning of uses and building maintenance. It is time for the state to consider the review of licensing and align it with the international model.

6. Conclusion

This research identified the concept of the oath as an important concept to make this two professions going along with an iterative process as the international system. This could be a step to promote the complementarity between architects and engineers in Algeria. The two professions, architects and engineers, in Algeria, show a lack of eligibility by the absence of a charter of ethics and professional conduct that is the cornerstone of any profession, avoiding the use of the oath of engineers. This charter seeks to resolve the problems of responsibilities of these two professions, see the oath. There is a modality of link between Architects and Engineers:

-*modality:* architects take an oath and Engineers do not take an oath
-*another modality*: architects take an oath and architect-engineers take an oath

The charter is a platform to regulate participation in the reflections, constitution and development of training and practices related to the double curriculum "Architect-Engineer, Engineer-Architect" which does not yet exist in Algeria. This calls for a need to revise the training course for the two professions in Algeria. In addition to ensure cohabitation of the two professions from the training.

Many factors as, the relational aspect, emotional action, interdependence and the degree of the level of training, could affect the complementarity in the interaction of those actors. The results of this research shed light on the protagonists and decision-makers on this unequal situation. Indeed, they offer the possibility of solving the problems linked to the concept of the

division of labor. For example, the oath could eliminates the inequalities of responsibilities and merits between architects and engineers in Algeria as following:

-*The composition of the team-actors:* the project is fully supported by high-level professionals such as architect-engineer, engineer-architect, who respond to the current training course. In addition, the fact of using new technologies makes it possible to maintain a high level of quality and to carry out large-scale projects with a team of actors of the quality "expert skills" in the materialization of these concepts of the sublime of architecture and engineering.

-*The vision:* Creativity and innovation are at the heart of the Sublime Architecture and Engineering approach. The protagonists have a young, refreshing and daring outlook that will delight even the most conservative of customers. The projects that pass through their hands are designed in a constructive logic to facilitate the task of the stakeholders and optimize the construction period.

-*Commitment:* Architects and engineers, commit themselves out of competitiveness, based on their knowledge, to propose sublime concepts of architecture and engineering. Be attentive to the needs of users, devote oneself to the search for original and ingenious solutions to the problems that may arise and work in full agreement with the various stakeholders of the project.

7. Limits and further research

Relational action and oath aspects can be explored by the complementarity in the interaction of the two professions with the degree of the level of training. Future research should be extended to explore this complementary relationship with the interaction of the user and the two professions in the design and construction process. It is time for the parent institution of the two professions to review the process of granting approvals and the structuring of the BEA and BET component in the image of international architectural and technical consultancies. So that the latter can manage large-scale projects which are treated, today, by foreign consultancies, even the Algiers mosque taken by a German BEAT and the restoration of the Kasbah of Algiers by the BEAT of Jean Nouvel,… .Etc.

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References

Augeron, M. (1999). Terre de mission au XIXe siècle. *L'Afrique*. *2*(03). 126-127.

Ben G. (2001) Années Maghreb. Retrieved from, www.journals.openedition.org on 10/11/2019

Bendaoud, L. (2010). Les ingénieurs en algérie. El Watan, 06.04.2010. Consulted on 20/11/2019.

Carley, M. (2000). Engineer Candela. Retrieved from www.amazon.fr › Michael-Carley on 20/11/2019.

Epron, J. P. (1981). Architecture and Rules. Liège: Mardaga.

Faber, J.H. (1963). Utilization of Coal ASH in Masonry construction, Boulder, Colorado: University of Colorado

Ferrier J. (1999). Engineer architect and Teacher. *Technique and architecture*, *445*(10-11). 84-85.

Fletcher, J. (2015). Performing Oaths in Classical Greek Drama. Ontario: Wilfrid Laurier

Goleman, D. (1998). L'intelligence émotionnelle. S.A. Editions Robert Laffont. Paris : Flammarion

Hadid, Z. *Taller Hong Kong***.** (2010). Interview**.** Retrieved from www.hk.asiatatler.com › life › interview-zaha hadid. Consulted on 10/11/2019.

Khelfaoui, H. (2000), Engineers in the education system. Paris : L'harmatan

Longuenesse, Élisabeth. (1990). Bâtisseurs et bureaucrates *: ingénieurs et société au Maghreb et au Moyen-Orient.Table ronde CNRS (Lyon, 16 au 18 mars 1990).* Maison de l'Orient méditerranéen

Ministry of Housing. (2003) The Law, Instruction n ° 06 of 07/31/2002 and n ° 02 of 01/26/2012

Ministry of Housing of Algeria, 13/12/2016 from email: yhammouche_dz@yahoo.fr>
Cc :mouloud_archi@yahoo.fr,clubnazim@yahoo.fr

National Charter, (1976). National législations on labor law, social security and human rights. Algéria. Retrieved from, www.ilo.org/dyn/natlex/natlex4.detail?p_isn=2043&p_lang=fr

Nouvel, J. & Baudrillard, J. (2013) Les objets singuliers. Edition Seuil. Paris : arléa

Oumelkhir, T. (2004). Les ingénieurs en Algérie de l'époque coloniale à la crise des années 1990. *L'Année du Maghreb*. *Vol*(05), 589-611.

Perassimos, S. (1990). Engineers. Retrieved from, www.academia.edu/11871194/Relatos_de_professores_sobre_manifestações_sexuais_de_alunos_com_deficiência_no_contexto_escolar on 20/01/2021

Prouvé, J. (1990). Jean Prouvé par lui-même. Liège : Mardaga

Schlaich, J. (2010). Engineer. *The art of the structural engineer*. 15 (12). P. 129.

Stéphane, DU CHATEAU, (1967). Architecte-Ingénieur-Conseil. Retrieved from www.archistructures.org/r_coupole agadir.htm

Vacher, H. (2004). Les figures de l'ingénieur colonial à la fin du XIX^{e} siècle. *Le Mouvement social*, *5*(10-12), 47-65.

Weill, J.M. (1999). Materiality of the project. Retrieved from, www.archdaily.com

www.commonedge.org/an-architects-oath-why-a-pledge-may-restore-the-publics-trust-in-the-profession

www.cambridge.org/dz/academic/subjects/classical-studies/classical-literature/performing-oaths-classical-greek-drama?format=PB
